

AMENDMENTS TO THE CLAIMS

Claim 1 (Currently Amended): An image collation apparatus characterized by comprising:

~~an image database for recording a second image as a registered image; first collation means (20, 22) for obtaining a coincidence ratio between first and second images within a printing element range for each collation unit by collating the first and second images with each other;~~

collation means for obtaining a plurality of coincidence ratios by collating a first image with the registered image,

minimum coincidence ratio extraction means (31) for obtaining a minimum coincidence ratio from the plurality of coincidence ratios obtained from said first collation means; and

determination means (50, 51) for determining that the first image and second images and the registered image are identical, if the extracted minimum coincidence ratio is smaller than a predetermined threshold value.

Claims 2-6 (Cancelled)

Claim 7 (Withdrawn): An apparatus according to claim 6, wherein the range predetermined for said first image transformation means (12) is narrower than the range predetermined for said second image transformation means (11).

Claim 8 (Withdrawn): An apparatus according to claim 6, wherein a collation region in which said second collation means (21) obtains the coincidence ratio is smaller than a collation region in which said first collation means (22) obtains the coincidence ratio.

Claim 9 (Withdrawn): An apparatus according to claim 6, wherein the translation amount, rotational angle, or translation amount and rotational angle by which said second image transformation means (12) moves the first image for each moving operation are larger than the translation amount, rotational angle, or translation

amount and rotational angle by which said first image transformation means moves the first image for each moving operation.

Claim 10 (Withdrawn): An apparatus according to claim 2, wherein
said apparatus further comprises
reference point detection means (70) for detecting reference points of the first and second images located at the first initial position, and
correction amount computation means (80) for obtaining a translation amount, rotational angle, or both translation amount and rotational angle of the first image which is required to make the reference points of the first and second image coincide with each other, and

said first image transformation means (13) moves the first image to a second initial position set by adding the translation amount, rotational angle, or translation amount and rotational angle obtained by said correction amount computation means (80) to the first initial position, and executes at least one of translation processing and rotation processing for the first image.

Claim 11 (Withdrawn): An apparatus according to claim 6, wherein
said apparatus further comprises
reference point detection means (70) for detecting reference points of the first and second images located at the first initial position, and
correction amount computation means (80) for obtaining a translation amount, rotational angle, or both translation amount and rotational angle of the first image which is required to make the reference points of the first and second image coincide with each other, and
said second image transformation means (14) moves the first image to a new first initial position set by adding the translation amount, rotational angle, or translation amount and rotational angle obtained by said correction amount computation means (80) to the first initial position, and executes at least one of translation processing and rotation processing for the first image.

Claim 12 (Withdrawn): An apparatus according to claim 1, wherein said apparatus further comprises region designation means (65) for sequentially designating a plurality of collation regions predetermined as regions in which the first and second images are collated with each other, and

said first collation means (20) obtains coincidence ratios by sequentially collating the first and second images with each other in the collation regions designated by said region designation means (65).

Claim 13 (Withdrawn): An apparatus according to claim 12, wherein said apparatus further comprises computation means (40) for averaging minimum coincidence ratios corresponding to the respective collation regions output from said minimum coincidence ratio extraction means (31), and

said determination means (50) determines that the first and second images are identical, if the minimum coincidence ratio average output from said computation means (40) is smaller than a predetermined threshold.

Claim 14 (Withdrawn): An apparatus according to claim 2, wherein said apparatus further comprises region designation means (65) for sequentially designating a plurality of collation regions predetermined as regions in which the first and second images are collated with each other, and

said first collation means (20) sequentially obtains a coincidence ratio by collating the first image output from said image transformation means with the second image in each collation region designated by said region designation means (65) every time said first image transformation means performs image processing.

Claim 15 (Withdrawn): An apparatus according to claim 14, wherein said apparatus further comprises computation means (40) for averaging minimum coincidence ratios corresponding to the respective collation regions output from said minimum coincidence ratio extraction means (31), and

said determination means (50) determines that the first and second images are identical, if the minimum coincidence ratio average output from said computation means (40) is smaller than a predetermined threshold.

Claim 16 (Withdrawn): An apparatus according to claim 14, wherein said apparatus further comprises selection means (70) for comparing minimum coincidence ratios corresponding to the respective collation regions which are output from said minimum coincidence ratio extraction means (31) and sequentially outputting only a predetermined number of minimum coincidence ratios in increasing order, and said computation means (40) averages the minimum coincidence ratios output from said selection means (70).

Claim 17 (Withdrawn): An apparatus according to claim 1, wherein said apparatus further comprises image processing means (600, 601) for selecting one of contraction and expansion for one of the first and second images and performing a plurality of different image processes, and said collation means collates an output from said image processing means with an image having undergone no image processing.

Claim 18 (Withdrawn): An apparatus according to claim 2, wherein said apparatus further comprises image processing means (600, 601) for selecting one of contraction and expansion for one of the first and second images and performing a plurality of different image processes, and said collation means collates an output from said image processing means with an image having undergone no image processing.

Claim 19 (Withdrawn): An apparatus according to claim 18, wherein said image processing means (600, 601) performs the plurality of different image processes by repeatedly executing image processing for the selected image for every predetermined amount.

Claim 20 (Withdrawn): An apparatus according to claim 18, wherein said image processing means comprises thinning means (610) for decreasing a line width of an input image to a value corresponding to about one pixel, and

expansion means (620) for fattening the image output from said thinning means, and

increases the line width corresponding to about one pixel to a predetermined width, and outputs the image.

Claim 21 (Withdrawn): An apparatus according to claim 18, further comprising storage means (701) for storing an image output from said image processing means and outputting the image to said collation means.

Claim 22 (Withdrawn): An apparatus according to claim 2, wherein said apparatus further comprises

second image transformation means (14) for repeatedly executing at least one of translation processing (shifting) and rotation processing for the first image located at the first initial position within a predetermined range for every predetermined amount, and outputting a first image after the processing,

second collation means (24) for obtaining a coincidence ratio by comparing/collating the first image output from said second transformation means with the second image every time said second image transformation means performs processing, and

storage means (61) for storing a translation amount, rotational angle, or translation amount and rotational angle of the first image from the first initial position to a current position when the coincidence ratio output from said second collation means becomes maximum, and

said first image transformation means (13) moves the first image to a second initial position set by adding the translation amount, rotational angle, or translation amount and rotational angle stored in said storage means (61) to the first initial position, and executes at least one of translation processing and rotation processing for the resultant first image.

Claim 23 (Withdrawn): An apparatus according to claim 22, wherein said apparatus further comprises image processing means (601) for selecting one of contraction and expansion for the second image and performing a plurality of different image processes, and

said storage means (701) for storing the second image output from said image processing means, and

said second collation means (24) obtains a coincidence ratio by comparing/collating the first image output from said second image transformation means with the second image output from said storage means every time said second image transformation means performs processing.

Claim 24 (Withdrawn): An apparatus according to claim 22, wherein the range predetermined for said first image transformation means is narrower than the range predetermined for said second image transformation means.

Claim 25 (Withdrawn): An apparatus according to claim 22, wherein the translation amount, rotational angle, or translation amount and rotational angle by which said second image transformation means moves the first image for each moving operation are larger than the translation amount, rotational angle, or translation amount and rotational angle by which said first image transformation means moves the first image for each moving operation.

Claim 26 (Withdrawn): An apparatus according to claim 22, wherein a collation region in which the coincidence ratio is obtained by said second collation means is smaller than a collation region in which a coincidence ratio is obtained by said first collation means.

Claim 27 (Withdrawn): An apparatus according to claim 3, wherein said apparatus further comprises region designation means (65) for sequentially designating a plurality of collation regions predetermined as regions in which the first and second images are collated with each other, and

said first collation means (20) obtains coincidence ratios by sequentially collating the first image output from said image transformation means with the second image within a collation region designated by said region designation means (65) every time said first image transformation means performs image processing.

Claim 28 (Withdrawn): An apparatus according to claim 27, wherein
said apparatus further comprises image processing means (600, 601) for selecting one of contraction and expansion for one of the first and second images and performing a plurality of different image processes, and
said first collation means collates an output from said image processing means with an image having undergone no image processing.

Claim 29 (Withdrawn): An image collation apparatus characterized by comprising:

first collation means (20, 22) for obtaining a relationship between first and second images for each collation unit by collating the first and second images with each other;

minimum coincidence ratio extraction means (31) for obtaining a minimum coincidence ratio from coincidence ratios in the relationship obtained from said first collation means;

determination means (50, 51) for determining that the first and second images are identical, if the extracted coincidence ratio is smaller than a predetermined threshold; and

region designation means (65) for sequentially designating a plurality of collation regions predetermined as regions in which the first and second images are collated with each other,

wherein said first collation means obtains coincidence ratios by sequentially collating the first and second images within the collation regions designated by said region designation means (65).

Claim 30 (Withdrawn): An apparatus according to claim 29, wherein said apparatus further comprises image processing means (600, 601) for selecting one of contraction and expansion for one of the first and second images and performing a plurality of different image processes, and

said first collation means collates an output from said image processing means with an image having undergone no image processing.

Claim 31 (Currently Amended): An image collation method characterized by comprising:

recording a second image as a registered image;

collating a first image with the registered image to obtain the first collation step (S5) of obtaining a plurality of coincidence ratios in a predetermined range between first and second images in each collation unit by collating the first and second images with each other;

the minimum coincidence ratio extraction step (S8) of obtaining extracting a minimum coincidence ratio from the plurality of coincidence ratios obtained from collating obtained in the first collation step (S5); and

the determination step (S12, S14, S15, S16, S17) of determining that the first image and a second registered image images are identical; if the extracted minimum coincidence ratio is smaller than a predetermined threshold value.

Claims 32-35 (Cancelled)

Claim 36 (Withdrawn): A method according to claim 32, wherein the method further comprises

the second image transformation step (S20) of repeatedly executing at least one image processing of translation processing and rotation processing for the first image located at a first initial position by a predetermined amount within a predetermined range, and obtaining the first image after image processing,

the second collation step (S21) of obtaining a coincidence ratio by collating the first image after the image processing with the second image every time image processing is performed for the first image, and

the storage step (S23) of storing a translation amount, rotational angle, or both a translation amount and rotational angle of the first image from the first information position to a current position when the coincidence ratio becomes maximum, and

in the first image transformation step (S25, S26), the first image is moved to a second initial position set by adding the translation, rotational angle, or translation amount and rotational angle stored in the storage step (S23) to the first initial position, and at least one of translation processing and rotation processing is executed for the first image.

Claim 37 (Withdrawn): A method according to claim 36, wherein the range predetermined in the first image transformation step (S25, S26) is narrower than the range predetermined in the second image transformation step (S20).

Claim 38 (Withdrawn): A method according to claim 36, wherein a collation region in which the coincidence ratio is obtained in the second collation step (S21) is smaller than a collation region in which the coincidence ratio is obtained in the first collation step.

Claim 39 (Withdrawn): A method according to claim 36, wherein the translation amount, rotational angle, or translation amount and rotational angle by the first image is moved in the second image transformation step (S12) for each moving operation are larger than the translation amount, rotational angle, or translation amount and rotational angle by which the first image is moved in the first image transformation step (S26) for each moving operation.

Claim 40 (Withdrawn): A method according to claim 32, wherein the method further comprises
the reference point detection step (S31) of detecting reference points of the first and second images located at the first initial position before the respective steps, and
the correction amount computation step (S32) of obtaining a translation amount, rotational angle, or both translation amount and rotational angle of the first image

which is required to make the reference points of the first and second image coincide with each other, and

the first image transformation step (S34) comprises the step of moving the first image to a second initial position set by adding the translation amount, rotational angle, or translation amount and rotational angle obtained in the correction amount computation step to the first initial position, and executing at least one of translation processing and rotation processing for the first image.

Claim 41 (Withdrawn): A method according to claim 36, wherein the method further comprises

the reference point detection step (S31) of detecting reference points of the first and second images located at the first initial position before the respective steps, and

the correction amount computation step (S32) of obtaining a translation amount, rotational angle, or both translation amount and rotational angle of the first image which is required to make the reference points of the first and second image coincide with each other, and

the second image transformation step (S36) comprises the step of moving the first image to a new first initial position set by adding the translation amount, rotational angle, or translation amount and rotational angle obtained in the correction computation step to the first initial position, and executing at least one of translation processing and rotation processing for the first image.

Claim 42 (Withdrawn): A method according to claim 33, wherein the method further comprises the region designation step of sequentially designating a plurality of collation regions predetermined as regions in which the first and second images are collated with each other, and

coincidence ratios are obtained by sequentially collating the first and second images with each other in the collation regions.

Claim 43 (Withdrawn): A method according to claim 42, wherein the method further comprises the image processing step of selecting one of contraction and expansion for one of the first and second images and performing a plurality of different image processes, and

the first and second images are collated with each other by collating the image having undergone the image processing with an image having undergone no image processing.

Claim 44 (Withdrawn): An image collation method characterized by comprising:

the first collation step of obtaining a relationship between first and second images for each collation unit by collating the first and second images with each other;

the minimum coincidence ratio extraction step of obtaining a minimum coincidence ratio from coincidence ratios in the relationship obtained in the first collation step;

the determination step of determining that the first and second images are identical, if the extracted coincidence ratio is smaller than a predetermined threshold; and

the region designation step of sequentially designating a plurality of collation regions predetermined as regions in which the first and second images are collated with each other,

wherein coincidence ratios are obtained by sequentially collating the first and second images within the collation regions.

Claim 45 (Withdrawn): A method according to claim 44, wherein the method further comprises the image processing step of selecting one of contraction and expansion for one of the first and second images and performing a plurality of different image processes, and

the first and second images are collated with each other by collating the image having undergone the image processing with an image having undergone no image processing.

Claim 46 (Currently Amended): A recording medium characterized by storing an image collation program instructions for causing a computer to execute:

recording a second image as a registered image;

collating a first image with the registered image to obtain a plurality of coincidence ratios;

extracting a minimum coincidence ratio from the plurality of coincidence ratios obtained from collating; and

determining that the first image and a registered image are identical if the extracted minimum coincidence ratio is smaller than a predetermined threshold value

the first collation step (S5) of obtaining a coincidence ratio in a predetermined range between first and second images in each collation unit by collating the first and second images with each other,

the minimum coincidence ratio extraction step (S8) of obtaining a minimum coincidence ratio from coincidence ratios obtained in the first collation step (S5), and

the determination step (S12, S14, S15, S16, S17) of determining that the first and second images are identical, if the extracted minimum coincidence ratio is smaller than a predetermined threshold.

Claims 47-50 (Cancelled)

Claim 51 (Withdrawn): A medium according to claim 46, wherein the program further comprises

the second image transformation step (S20) of repeatedly executing at least one image processing of translation processing and rotation processing for the first image located at a first initial position by a predetermined amount within a predetermined range, and obtaining the first image after image processing,

the second collation step (S21) of obtaining a coincidence ratio by collating the first image after the image processing with the second image every time image processing is performed for the first image, and

the storage step (S23) of storing a translation amount, rotational angle, or both a translation amount and rotational angle of the first image from the first information position to a current position when the coincidence ratio becomes maximum, and

in the first image transformation step (S25, S26), the first image is moved to a second initial position set by adding the translation, rotational angle, or translation amount and rotational angle stored in the storage step (S23) to the first initial position, and at least one of translation processing and rotation processing is executed for the first image.

Claim 52 (Withdrawn): A medium according to claim 51, wherein the range predetermined in the first image transformation step (S25, S26) is narrower than the range predetermined in the second image transformation step (S20).

Claim 53 (Withdrawn): A medium according to claim 51, wherein a collation region in which the coincidence ratio is obtained in the second collation step (S21) is smaller than a collation region in which the coincidence ratio is obtained in the first collation step.

Claim 54 (Withdrawn): A medium according to claim 51, wherein the translation amount, rotational angle, or translation amount and rotational angle by the first image is moved in the second image transformation step (S12) for each moving operation are larger than the translation amount, rotational angle, or translation amount and rotational angle by which the first image is moved in the first image transformation step (S26) for each moving operation.

Claim 55 (Withdrawn): A medium according to claim 46, wherein the program further comprises
the reference point detection step (S31) of detecting reference points of the first and second images located at the first initial position before the respective steps, and
the correction amount computation step (S32) of obtaining a translation amount, rotational angle, or both translation amount and rotational angle of the first image which is required to make the reference points of the first and second image coincide with each other, and

the first image transformation step (S34) comprises the step of moving the first image to a second initial position set by adding the translation amount, rotational angle,

or translation amount and rotational angle obtained in the correction amount computation step to the first initial position, and executing at least one of translation processing and rotation processing for the first image.

Claim 56 (Withdrawn): A medium according to claim 46, wherein the program further comprises the reference point detection step (S31) of detecting reference points of the first and second images located at the first initial position before the respective steps, and the correction amount computation step (S32) of obtaining a translation amount, rotational angle, or both translation amount and rotational angle of the first image which is required to make the reference points of the first and second image coincide with each other, and the second image transformation step (S36) comprises the step of moving the first image to a new first initial position set by adding the translation amount, rotational angle, or translation amount and rotational angle obtained in the correction computation step to the first initial position, and executing at least one of translation processing and rotation processing for the first image.

Claim 57 (New): The apparatus according to claim 1, wherein said first image is obtained by capturing a test image.

Claim 58 (New): The apparatus according to claim 1, further comprising: an image input unit for capturing a test image, wherein said first image is obtained by dividing said captured test image into a collation unit.

Claim 59 (New): The apparatus according to claim 1, wherein said collation unit is a pixel unit.

Claim 60 (New): The apparatus according to claim 1, wherein said collation includes parallel movement processing and rotation processing.

Claim 61 (New): The apparatus according to claim 1, wherein when said collation processing of a predetermined threshold value ends, the collation processing including parallel movement or rotation to the next collation range is performed.

Claim 62 (New): The image collation method according to claim 31, further comprising:

capturing a test image to obtain the first image.

Claim 63 (New): The image collation method according to claim 32, capturing further comprising:

dividing the test image into a collation unit to obtain the first image, wherein an image input unit used for capturing.

Claim 64 (New): The image collation method according to claim 63, wherein said collation unit is a pixel unit.

Claim 65 (New): The image collation method according to claim 62, collating further comprising:

processing parallel movement, and
processing rotation processing.

Claim 66 (New): The image collation method according to claim 31, wherein the collating includes processing one of parallel movement and rotation to a next collation threshold value if collating ends for the predetermined threshold value.

Claim 67 (New): The recording medium according to claim 46, further comprising instructions to cause the computer to execute:

capturing a test image to obtain the first image.

Claim 68 (New): The recording medium according to claim 46, capturing further comprising:

dividing the test image into a collation unit to obtain the first image, wherein an image input unit used for capturing.

Claim 69 (New): The recording medium according to claim 46, wherein said collation unit is a pixel unit.

Claim 70 (New): The recording medium according to claim 46, collating further comprising:

processing parallel movement, and
processing rotation processing.

Claim 71 (New): The recording medium according to claim 46, collating further includes processing one of parallel movement and rotation to a next collation threshold value if collating ends for the predetermined threshold value.